AMENDMENTS TO IN THE SPECIFICATION

Please replace the paragraph beginning on page 9, line 1 with the following amended paragraph:

--Gash et al., in "Efficient Recovery of Elemental Mercury [[form]] from Hg(II)-Contaminated Aqueous Media Using a Redox-Recyclable Ion Exchange Material," Environ. Sci. Techno., 1998, pp. 1007-1012, 32(7), American Chemical Society, discloses the use of lithium-intercalated transition metal dichalcogenides as redox-recyclable ion-exchange materials for the extraction of heavy metal ions from water. The reference also discloses a semisynthetic ion-exchange material named thiomont, which is a thioalkylated montmorillonite clay. This reference is limited in that is does not disclose compositions of the type disclosed herein and the compositions that it does disclose can only be used in water treatment.--

Please replace the paragraph beginning on page 9, line 18 with the following amended paragraph:

--U.S. Patent Application Serial [[Nos.]] No. 10/134,178, filed April 26, 2002, discloses ion exchanged silicate substrates. The plate-like substrates support thin layers of metal sulfides between the plates. The polyvalent metals in the metal sulfides are typically derived from one or more polyvalent metals in the transition series of the Periodic Table of the Elements. The sorbent is manufactured by conducting the ion exchange between the polyvalent metal and the ion exchange sites in the substrate under acidic conditions. Following ion exchange, the substrates are washed to remove the acid and stabilized using a sulfide source under alkaline conditions. Although the sorbents have proven highly effective in removing mercury, whether in elemental or speciated form, the process to produce the sorbent can be expensive. The use of acidic conditions typically requires more expensive equipment than alkaline conditions and the transition from acid to alkaline conditions causes consumption of acid, thereby increasing reagent costs.--

Please replace the paragraph beginning on page 22, line 3 with the following amended paragraph:

--Referring now to [[Figs.]] Fig. 3A, a raw substrate 400 is comminuted in step 404 by suitable techniques, such as by wet or dry crushing, wet or dry grinding, and the like, to form a slurried comminuted substrate 408. The slurried comminuted substrate 408 preferably has a P_{90} size of no more than about 10 microns.--

Please replace the paragraph beginning on page 22, line 19 with the following amended paragraph:

--In step 424, ammonia is added to a metal salt solution 428 and the mixture blended in step 432 to form a metal ammonia solution 436. The metal salt may be in any form, such as a chloride, sulfate, nitrate, and/or hydroxide. The concentration of the polyvalent metal in the metal salt in the metal solution 428 preferably ranges from about 2 to about 15 wt%, and the pH of the solution 428 from about pH 1 to about pH 2. Sufficient ammonia is added to the solution 428 to convert at least most of the polyvalent metal into a polyvalent metal-ammonia complex. As used herein, "polyvalent metal ammonia complex" includes any complex or compounds between the polyvalent metal cation and the ammonia ion, including without limitation the tetrammine copper complex [[and0]] and cuprammonium complex. When copper is the polyvalent metal, copper is initially precipitated as a copper hydroxide, and the solution turns opaque. Continued addition of ammonia redissolves the copper hydroxide and causes the solution to turn dark blue. Preferably, at least most, more preferably at least about 95% of the polyvalent metal in the metal ammonia solution 436 is in the form of a dissolved polyvalent metal-ammonia complex (such as tetrammine copper, or cuprammonium complexes). Typically, the concentration of the polyvalent metal-ammonia complex in the metal ammonia solution 436 ranges from about 1 to about 10 wt.%. The pH of the metal ammonia solution typically is at least about pH 7, and even more typically at least about pH 9, to about pH 10 to about pH 12.--

Please replace the paragraph beginning on page 24, line 20 with the following amended paragraph:

--Accordingly, clays, such as montmorillonite, exhibit two forms of exchange one of which is pH independent and one that is pH dependent. The pH_{ZPC} of various substrates depends of course on the substrate. For example, the [[is]] pH_{ZPC} for montmorillonite is from about pH 2 to about pH 3.--

Please replace the paragraph beginning on page 25, line 3 with the following amended paragraph:

--The pH of the metal ammonia solution 436 immediately before the mixing step 440 and of the slurried comminuted substrate during the mixing step [[444]] 440 is preferably above the pH_{ZPC}, more preferably at least about pH 7, even more preferably at least about pH 9, and even more preferably ranges from about pH 10 to about pH 12. At higher pH's, the ion exchange capacity is typically increased by at least about 80 to about 120% relative to ion exchange performed at pH's below the pH_{ZPC}.--

Please replace the paragraph beginning on page 31, line 5 with the following amended paragraph:

--This Example describes preparation of several polyvalent metal sulfide-substituted sorbents of the present invention, using various amounts of cuprammonium ion for substitution.--

Please replace the paragraph beginning on page 31, line 7 with the following amended paragraph:

--All steps in all Examples (unless otherwise noted) were carried out at room temperature. All reagents are obtainable from Sigma Chemical, St. Louis, MO) except as noted. To a beaker, approximately 20 milliliters (mL) of copper chloride, to give a final concentration of 2%, 5%, or 10% (w/v) of copper in 100 mL, was added. Following addition of copper chloride, enough ammonium hydroxide was added to dissolve the copper chloride. Distilled deionized water was then added to bring the solution to 100 mL total. See Table 1 for further experimental details. To the prepared cuprammonium reagent, 10 g of vermiculite Palabora #4 (obtainable from Palabora, Inc. Palabora, South Africa), ground or milled to 90% less than 10 micrometers, ~~is added per beaker~~ were weighed out and placed in each beaker to form a slurry. All substrates are pretreated before use by exfoliation (either by hydrogen peroxide treatment or heat treatment) and ground or comminuted to approximately 10 microns. The slurry was then rotated at approximately 50 rpm overnight. After incubation, the reaction was centrifuged in order to separate the liquid and the solid, and the liquid was removed for metal recovery. After the overnight reaction, the polyvalent metal is stabilized to yield stabilized ion exchange substrate by resuspending the solid using a 10% aqueous solution of sulfide to form a slurry. In this Example, either sodium sulfide or CASCADE (calcium polysulfide, available from BSP, [[inc.]] Inc., Fresno, Ca) was added, approximately 100 ml. The slurry was then centrifuged to separate the liquid and the solid. The solid was rinsed once with 100 mL distilled deionized water, and recentrifuged to remove liquid. The solid then consisted of a stabilized ion exchange substrate. The stabilized ion exchange ~~substates~~ substrates were then dried at 40° C overnight.--

Please replace the paragraph beginning on page 31, line 17 with the following amended paragraph:

--This Example describes preparation of several polyvalent metal sulfide-substituted sorbents of the present invention, using various amounts of cuprammonium ion for substitution.--

Please replace the paragraph beginning on page 31, line 19 with the following amended paragraph:

--All steps described in Example 1 were carried out in this Example, with the exception being in the sulfide addition step. In this Example, either sodium sulfide or CASCADE (calcium polysulfide, available from BSP, [[inc.]] Inc., Fresno, Ca) was added until the pH was above 8. The slurry was processed to completion as described in Example 1.--

Please replace the paragraph beginning on page 33, line 11 with the following amended paragraph:

--This Example describes preparation of several polyvalent metal sulfide-substituted sorbents of the present invention, using various amounts of cuprammonium ion for substitution.--

Please replace the paragraph beginning on page 33, line 13 with the following amended paragraph:

-- All steps described in Example 1 were carried out in this Example, with the exception being in the sulfide addition step. In this Example, either sodium sulfide or CASCADE (calcium polysulfide, available from BSP, [[inc.]] Inc., Fresno, Ca) was added as follows. When the amount of sulfide added was 126 mL, a final pH of 9.44 was recorded. When the amount of sulfide added was 132 mL, a final pH of 10.2 was recorded. The slurry was processed to completion as described in Example 1.--

Please replace the paragraph beginning on page 35, line 18 with the following amended paragraph:

--Sorbents were prepared as described in Examples 1-3 with the exception that montmorillonite was substituted for vermiculite for some of the test sorbents. In this Example, stabilized ion exchanged agents using either bentonite (montmorillanite) or vermiculite as the substrate were prepared as described in Examples 1-3. For samples #7 and #8 in Table 5, bentonite was obtained from the Lovell mine, Wyoming. Substrates were substituted at the 10% copper level with cuprammonium, then treated with either calcium polysulfide or sodium sulfide as described in Examples 1-3.--

Please replace the paragraph beginning on page 39, line 16 with the following amended paragraph:

--Moreover though the description of the invention has included description of one or more embodiments and certain variations and modifications ~~modifications~~ are within the scope of the invention, e.g., as may be within the skill and knowledge of those in the art, after understanding the present disclosure. It is intended to obtain rights which include alternative embodiments to the extent permitted, including alternate, interchangeable and/or equivalent structures, functions, ranges or steps to those claimed, whether or not such alternate, interchangeable and/or equivalent structures, functions, ranges or steps are disclosed herein, and without intending to publicly dedicate any patentable subject matter. --